never witnessed the conduct of the animal during suction; consequently he could not know anything from his own experience concerning the organ which plays the principal part in that act. But he might have learned it from Swammerdam; for it is precisely the pumping-ventricle, and not the œsophagus, which Swammerdam accurately describes*, comparing its movement to that of the balance in a watch, in the place alluded to by Burmeister.

If, in conclusion, we now read Swammerdam's treatise with a little attention, we shall find that his investigation, as far as it goes, is not less ingenious and faultless here than elsewhere in his incomparable work; nor is the description less full, perspicuous, and vivid, nor less rich in pointed expressions and happy comparisons, written as it is in that *naïve* and communicative style which even a whole century later was still characteristic of many excellent observers of natural history. Of course one ought not to content one's self with the Latin translation, but study the Dutch original—an undertaking which at any rate to a Dane has no difficulty, and which he least of all could wish to evade.

XXV.—*On the Tubulation of the Valves of* Rhynchopora Geinitziana, *De Verneuil.* By Professor W. King.

In my former papers on *Rhynchopora Geinitziana*, I have described and inferred its histological character from surface-observations made with a Coddington lens†. But objections having been taken to a hand magnifier as possessing too low a power to settle unequivocally the question whether the above-named Permian fossil is, as I have all along maintained‡, characterized by tubes passing completely through its valves, I have felt it necessary to

* "Whenever the louse is busy sucking, we see a small current of blood just behind the sting (tab. 2. fig. 3 *u*), which shines through the head. Between and in front of the eyes, in the middle of the head, we perceive a tolerably large dilatation (*x*); so that the swallow, through the constantly ascending blood, in that place is appreciably distended. And then these parts contract themselves again so quickly that one scarcely sees any more blood. And this works so rapidly that one can hardly distinguish the expansion from the contraction: so that I cannot compare it to anything better than to the quick movement of the balance in a watch. Behind the eyes in the head, we see nothing but a similar diminutive current of blood pass through; and this passage is, in my opinion, properly the gullet (*f*), which follows the swallow, and which is again dilated in the neck of the louse, as shown in the drawing (*g*). And all this I have intentionally figured as a continued tube, in order that my description might be the clearer."—*Bibl. Nat.* i. p. 79.

† Through a misunderstanding, I have hitherto called this magnifier a "Stanhope lens."

‡ See Ann. & Mag. Nat. Hist. ser. 2. vol. xvii. p. 334, &c., ser. 3. vol. xvi. p. 124, &c.; Reader, No. 138, August 19, 1865.

make additional observations on some specimens from Gera, with one of Smith and Beck's highest-class binocular microscopes, for the use of which I am indebted to its owner, Dr. Rowney. I shall now relate the results of my last investigations.

In order to ensure an examination of the entire thickness of the valves, I operated on specimens partially imbedded in their matrix, which is siliceo-calcareous and granular.

Figure 1 represents a polished medio-longitudinal section of one of these specimens, about thrice its natural size. The interior is filled with calcite. The letter *a* refers to the matrix, which adheres to a considerable portion of the perforate valve. In this case, there can be no doubt that the extraneous mineral matter covers the original outer surface of the fossil. At the umbonal region, *b*, the external layers of the test are not present, having got detached along with the matrix before the specimen came into my hands: the surface exposed at this part, as well as that of the imperforate valve, displays numerous dark-coloured spots, resembling those resulting from tubulation in many Palliobranchs, particularly the Carboniferous *Spiriferina octoplicata*, in which, however, they are larger.

Fig. 1.

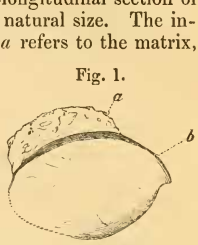

Figure 2 represents a portion, from below the letter *a*, of the last section, as seen under a magnifying power of 120. Two of the tubes are insufficient for our purpose, having been broken short of their length by the removal of the outer layers and matrix; but the next one is conclusive, as it passes completely through the valve. The fourth or adjoining tube does not appear to reach the exterior.

Fig. 2.

Figure 3 represents a portion of a similar longitudinal section, as seen under the same power. It shows two tubes traversing the thickness of the valve to the *outer surface*, and a third one apparently passing to within a very short distance of it. I strongly suspect that the last tube, as well as the "fourth" in fig 2, is not in reality any shorter than the others, because precisely where it appears to terminate the test loses its semitransparency (brought out by the

Fig. 3.

polishing) and becomes opaque: and there are strong indications that it sinks under this part, and consequently passes below the plane of the section, thus becoming intercepted or getting beyond the range of vision. Although this figure shows the tubes to increase in width as they approach the outer surface, I have no doubt that the appearance is caused by their axis not being parallel to the plane of section, or, in other terms, by the section cutting them obliquely. A similar appearance would be presented by a vertical section in which the tubes do not lie perpendicular to the surface of the valves. The middle tube is a case somewhat in point; and it is valuable in another respect, inasmuch as it shows, what *might have been readily conceived*, that vertical sections may be obtained in which *the tubes deviate from the plane of section*, presenting, in consequence, *an appearance as if they terminated before reaching the exterior*.

From what I have observed in other sections—longitudinal, transverse, and tangential—of *Rhynchopora Geinitziana*, it seems to be difficult to obtain one showing a number of tubes closely associated and passing through the entire thickness of the valves; at least, I have only seen from one to three—never more—cut by the plane of a single section*. This circumstance is to some extent accounted for by the occasional, perhaps general, inclination of the tubes†, also by the fact that, with rare exceptions, they are irregularly arranged: a quincunx or linear arrangement, a tendency to which has only once occurred to me, would, it is evident, bring a greater number into view. The incomplete infilling of the tubes, noticed presently, furthermore explains their rareness in the sections I have examined.

In my last paper in the 'Annals,' August 1865, p. 125, it is stated that "I am disposed to regard the dark colour of the tubes as due to the carbonaceous residuum of the membrane with which they were originally occupied." Recent observations, made with a power of 210, show, however, that what were taken for the remains of organic matter are aggregations of cubical crystals of pyrites.

It has also occurred to me that the tubes are often either faintly indicated, or rarely completely filled with pyrites, as most of them contain only here and there, throughout their length, separated clusters of crystals, while their remaining portion appears to have an infilling similar to the calcareous substance now composing the test. Hence, evidently, is explained the existence,

* Owing to the semitransparency of the test, the binocular occasionally discloses other tubes *reaching the surface* below the plane of section.

† This inclination is displayed in other sections that I have made of the present species; and it is well known to be frequent in other Palliobranchs.

mentioned in my last communication, of specimens showing little or no appearance of a tubular structure on their exterior.

In conclusion, if the surface-observations which I have hitherto brought under the notice of palæontologists have not been deemed sufficient to show that the valves of *Rhynchopora Geinitziana* are tubulated through and through, like those of species belonging to nearly every family of the *Palliobranchiata*, it is to be hoped that the clear evidence adduced in the present paper will be accepted as entirely removing all doubts on the matter.

Belmont, near Galway.
Feb. 14, 1866.

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Whether we are to regard the ancient traditions of an Atlantis as pure fables, or as springing from some germ of truth, there can be no doubt that its scattered islands, as the last relics of a great submerged continent, must ever be looked upon with interest by the naturalist. We cannot tell whether their summits were gazed upon by men when this country was under an icy sea and the reindeer wandered over Southern France, which would probably carry back the time

"When first Madeira trembled to a kiss"

to a period considerably earlier than that ascribed to this remarkable phenomenon by the Rev. Mr. Bowles; but we may justly regard the animal inhabitants of these islands as representatives, perhaps somewhat changed, of the great fauna of the lands now forming the sea-bottom of the Atlantic, crowded together upon the highest points to which they had access, and looking out, Deucalion-like, over the flood that has destroyed the home of their progenitors.

Looked at in this light, a sort of dramatic interest seems to surround these dwellers in the islands of the sea—an interest, however, which cannot but heighten our curiosity to know as much as possible about them; whilst at the same time the data to be obtained from their study, in connexion with the great question of the origin of species, are of such importance that their careful investigation must be considered one of the greatest services that can be rendered to philosophical zoology.

Already some of these islands had received a portion of the atten-